ments adapted to sea-conditions, for establishing a practicable and suitable routine of observing and of checking instruments and in general for learning how to make magnetic observations at sea far more accurately and systematically than had ever before been attempted.

The "magnetic constants" of this wooden sailing vessel were smaller than those of any vessel which had been previously used for magnetic observations; but, small as they were, they necessitated many corrections and frequent "swinging the ship" to obtain the accuracy which Dr. Bauer had determined upon as the goal to be attained. This not only consumed much time, but also diminished the precision of the final results. Accordingly, the non-magnetic yacht *Carnegie* was built in 1909 in which the use of iron was almost wholly avoided; wooden pins, and bolts of copper and of Tobin bronze took the place of iron nails, the producer gas engine used for auxiliary power was constructed of bronze, and the only magnetic materials used were the steel valves, piston rings and cam-rollers. Repeated tests have shown that this unique vessel has no appreciable effect upon the instruments; and in her various cruises aggregating more than 160,000 miles, observations have been obtained with comparative ease and rapidity whose accuracy is far beyond anything which had previously been possible at sea.

The first 154 pages of the present volume give an account of the work done on the *Galilee,* while the remainder deals in the same way with the observations made on the *Carnegie.* The various instruments are fully described and illustrated, and it is most interesting to follow their gradual improvement and perfection. To the experimental physicist this is one of the most attractive portions of the report; especial mention may be made of the beautiful and ingenious marine earth-inductor described on pp. 196 et seq. A full account is given of the methods of making observations, their reduction and correction and of the system of checks and controls between the various instruments, as well as those introduced by shore observations which were made at every opportunity. The final results for each cruise are given in tabular form and no detail is omitted which might add to their usefulness.

In addition to the magnetic measurements, systematic observations were also carried out on atmospheric electricity, ionization and radio-activity; these form the subjects of the special reports with which the volume closes.

The practical utility of this great series of magnetic observations in correcting mariners' charts of magnetic variation is obvious; serious errors in the present charts have been found and their correction lessens the dangers of navigation in times of storm and fog when astronomical observations are impossible. And quite apart from this most useful result the ultimate scientific value of such a survey continued year after year, as it will doubtless be when the war is over, is very great. The earth's magnetism is one of the great mysteries of physical and cosmical science; observations on land alone cover too small an area of the earth's surface to afford an adequate basis of knowledge of the earth's field and of the intricacies of its secular variations. Continued, systematic sea observations of the accuracy of those recorded in this report form a necessary stage in the solution of the great problem; when that is obtained it will doubtless lead to a further knowledge of the sun's magnetism and may well have results of the highest significance in cosmical theory.

This volume is a monument to the well-directed enthusiasm and foresight of Dr. Bauer and to the skill and zeal of his associates. In this case as in many others the Carnegie Institution deserves the thanks of the scientific world for generously supporting and wisely forwarding work which could scarcely have been done at present by any other agency.

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THE RELATION OF THE MALPIGHIAN TUBULES OF THE HIND INTESTINE IN THE HONEYBEE LARVA

IT has been known for nearly a hundred years that the mid-intestine of larvæ of bees

and wasps was essentially a blind sac.[1] The subsequent establishment of communication between the mid and hind-intestine in the larvæ of various members of the Hymenoptera was long since noted and has been studied in detail by Rengel.[2] The relation of the Malpighian tubules to the hind-intestine in the Hymenoptera has, on the other hand, been strangely neglected, being mentioned only incidentally or completely ignored. For example, both Anglas[3] and Rengel merely state that in the late larva or semipupa of the honeybee the Malpighian tubules open into the hind-intestine, and ignore the earlier stages. Karawaiew[4] and Perez[5] describe the Malpighian tubules in the ant larva as opening into the hind-intestine. This condition, however, does not obtain in case of the feeding larva of the honeybee, the central (caudal) ends of the tubules being blind from the time of hatching up to the sealing of the cell. The relation of the tubules to the hind- and mid-intestine during the feeding period is briefly as follows: The posterior end or fundus of the mid-intestine is, as already stated, completely closed, the epithelium being continuous here. The cephalic end of the hind-intestine is enlarged and the mouth of this enlargement closed by a thin diaphragm-like layer of cells continuous marginally with the wall of the hind-intestine The central part of this diaphragm-like structure is closely applied to the external surface of the fundus of the mid-intestine which is here devoid of a muscular coat. The pointed central blind ends of the four Malpighian tubules are inserted between these two layers, two on each side, but their tips do not extend quite to the center of the area of attachment of the mid- and hind-intestines.

In the newly hatched larva the Malpighian tubules are slender tubes, and pursue a winding course from their point of attachment up to the second or third thoracic segment, lying between the capacious mid-intestine and the body wall. Their lumen is minute, the walls being relatively very thick and composed of cells whose depth and breadth are approximately equal. In the mature larva on the other hand the Malpighian tubules are relatively voluminous, attaining, near their posterior ends, a diameter greater than that of the hind-intestine. The posterior or central ends themselves, however, always remain of small diameter. Sections through the tubules at this stage show that the walls are extremely thin and composed of flat cells. In fact, the tubules might well be described as "thin-walled tubular sacs." Evidences of distension by internal pressure are obvious.

After the larva has been sealed up in its cell by a waxen capping both the fundus of the mid-intestine and the diaphragm-like epithelium closing the cephalic end of the mid-intestine become perforated, thus establishing an avenue of communication between the mid- and hind-intestine through which the fæcal accumulations of the mid-intestine are expelled. At the same time that this occurs each of the Malpighian tubules establishes connection with the hind-intestine by means of a fine canal which perforates the diaphragm-like layer of cells which formerly closed the anterior end of the hind-intestine but which now forms an annular structure uniting the mid- and hind-intestines. Sections through the tubules show that they have greatly diminished in calibre, the walls being more or less collapsed and their component cells being correspondingly narrower and deeper.

The history of the Malpighian tubules and that of the mid-intestine during the feeding period of larval life are therefore parallel in that both, in addition to performing their

[1] Dutrochet, R. J. H., "Mémoire sur les métamorphoses du canal alimentaire chez les Insectes," *Jour. de Phys.*, LXXXVI., 1818.

[2] Rengel, C., "Uber den Zusammenhang von Mitteldarm und Enddarm bei den Larven der aculeaten Hymenopteren," *Zeit. wiss. Zool.*, LXXV., 1902.

[3] Anglas, M. J., "Observations sur les métamorphoses internes de la Guepe et de l'Abeille," *Bull. Sci. France et Belg.*, XXXIV., 1901.

[4] Karawaiew, W., "Die nachembryonale Entwicklung von *Lasius flavus*," *Zeit. wiss. Zool.*, LXIV., 1898.

[5] Perez, Ch., "Contribution a l'étude des métamorphoses," *Bull. Sci. France et Belg.*, XXXVII., 1903.

original functions, retain and store up the accumulated excreta which is discharged only after feeding ceases, when such discharge on the interior of the cell occupied by the larva would not involve contamination of the food.

BUREAU OF ENTOMOLOGY, JAS. A. NELSON
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SPECIAL ARTICLES

CONCERNING THE EFFECT OF INGESTED PLACENTA ON THE GROWTH-PROMOTING PROPERTIES OF HUMAN MILK

IT has been shown that the feeding of desiccated placenta to women during the first eleven days after parturition causes an increase in the protein and lactose per cent. of the milk.[1]

The present report is concerned with the growth of the infants subsisting upon the milk from the above sources. As a basis for comparison there is used the growth of the infants whose nourishment was derived from the women whose milk production was not subjected to the influence of ingested desiccated placenta.

In the tables at the end of this paper the number assigned to the infant corresponds to the number given to the mother in the previous reports.[1] It should be remembered that all the mothers were receiving the same diet and that to the second set 0.6 gm. of desiccated placenta was fed three times a day throughout the period.

Certain definite differences in the progress of growth of the two sets of infants are to be observed.

The variation limit per cent. from day to day, and the absolute per cent. variation from day to day is less in degree and tends to take on more of a positive character in those infants whose mothers were fed the desiccated placenta. Also the per cent. variation from the first day, both as regards its limits and its average is at all times less in degree. The general trend of these latter values is towards zero; this is not to be seen with the infants receiving milk from uninfluenced sources.

[1] Hammett, F. S., and L. G. McNeile, *Jour. Biol. Chem.*, 1917, XXX.; Hammett, F. S., *Jour. Biol. Chem.*, 1917, XXIX., 381.

It is evident that the recovery from the postnatal decline in weight is hastened by the consumption of milk produced under the influence of maternally ingested placenta.

It is obviously possible to eliminate from consideration the increase in protein and sugar production induced by the placental feeding as the cause of the early weight increase.

TABLE I

The Weights during the First Eleven Days after Birth of the Infants receiving Milk from the Mothers whose Production was Uninfluenced by the Ingestion of Desiccated Placenta

Infant No...	1, Oz.	2, Oz.	3, Oz.	4, Oz.	5, Oz.	6, Oz.	7, Oz.	8, Oz.
Day 1.....	118	148	120	120	119	104	96	144
2.....	108	138	116	111	114	98	91	143
3.....	107	130	114	107	112	100	94	131
4.....	109	129	109	110	106	102	94	135
5.....	106	129	112	111	105	104	100	134
6.....	105	132	114	104	106	104	96	134
7.....	108	131	112	104	108	104	98	141
8.....	108	130	108	102	107	107	91	143
9.....	105	129	109	105	108	104	91	149
10.....	108	128	108	112	103	107	93	146
11.....	108	129	108	114	104	107	96	148

TABLE II

The Weights during the First Eleven Days after Birth of the Infants receiving Milk from the Mothers whose Production was Influenced by the Ingestion of Desiccated Placenta

Infant No...	1, Oz.	2, Oz.	3, Oz.	4, Oz.	5, Oz.	6, Oz.	7, Oz.	8, Oz.
Day 1.....	150	119	111	135	144	76	114	123
2.....	138	115	108	123	142	72	112	117
3.....	133	112	101	123	136	71	107	121
4.....	134	112	100	123	136	72	108	122
5.....	140	113	99	124	138	72	110	119
6.....	140	114	100	123	143	72	106	126
7.....	142	115	100	124	146	73	104	126
8.....	145	118	102	124	147	76	106	124
9.....	149	118	101	124	144	76	108	118
10.....	153	116	99	128	144	75	106	126
11.....	150	116	98	130	143	75	108	126

These results may then be best interpreted on the assumption of the presence of some growth-promoting factor in the ingested placenta, which has been passed on to the infants in the milk. There is thus opened up the probability of the placenta taking some part in